

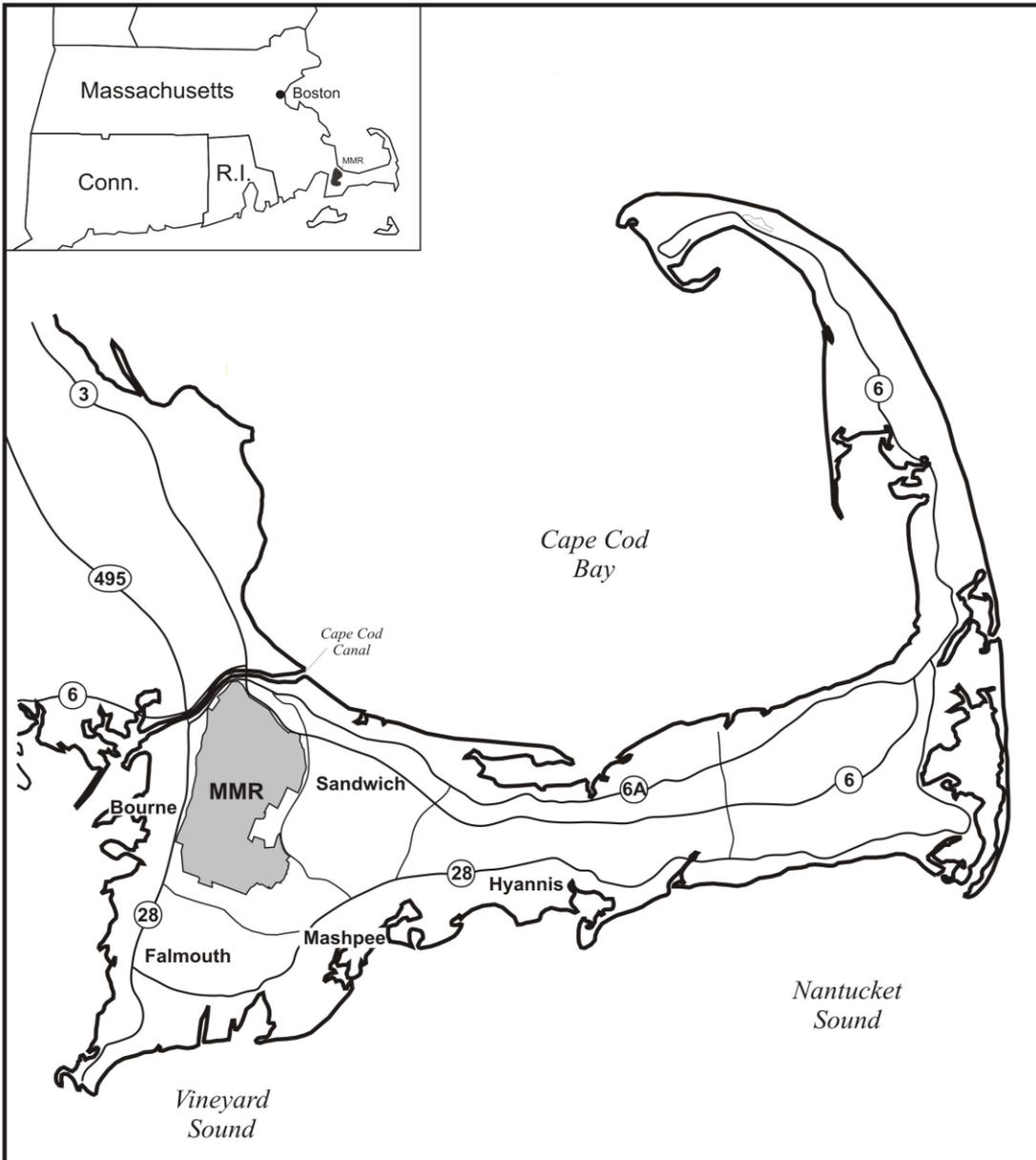
**Air Force Center for
Engineering and the
Environment
Massachusetts Military
Reservation**

Wind Turbine Projects

11 July 2011

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AFCEE/MMR**



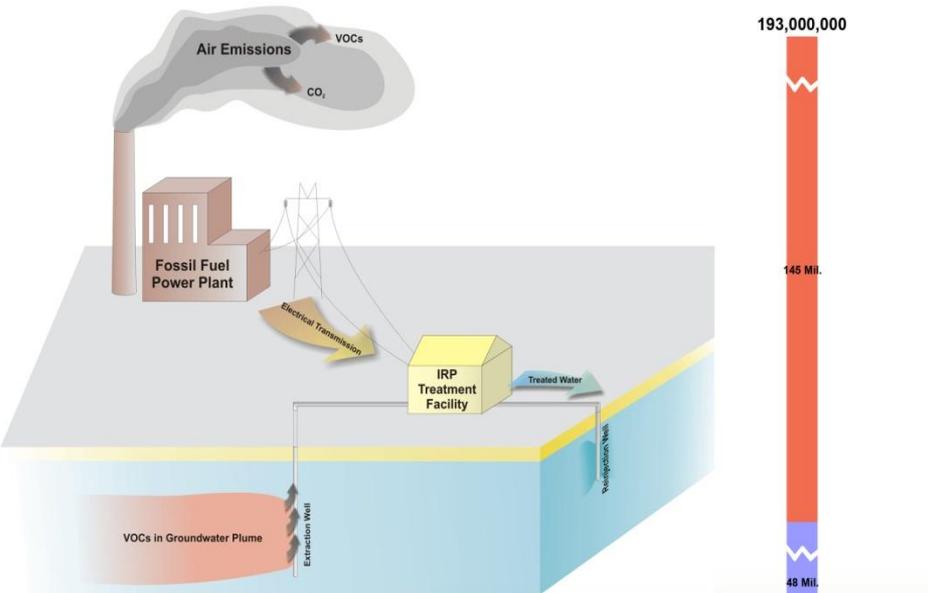


The Installation Restoration Program at the Massachusetts Military Reservation (MMR)

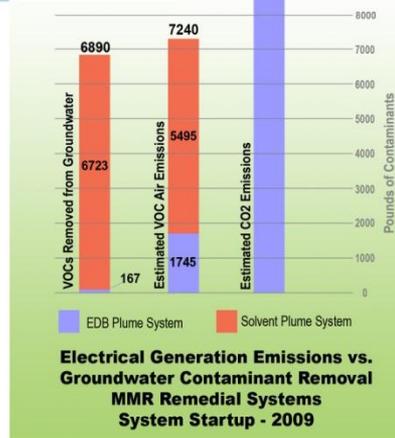


**Air Force Center for
Engineering and the Environment**

Impacts of Electricity Generation



Electricity Generation to Power IRP Remedial Systems Results in Air Emissions Including Greenhouse Gases

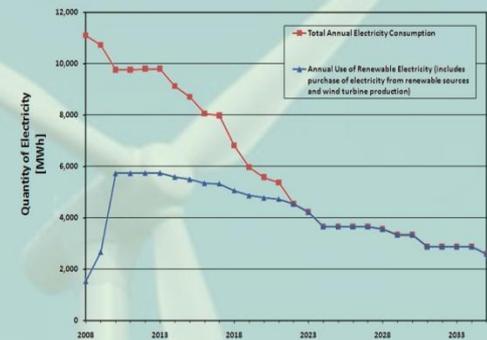


Green Power: Wind Turbine Coming Soon !

Purpose of Project:

- Generate electricity using renewable energy to reduce cost
- Offset air emissions from commercial plants
- Expected to provide 25% - 30% of program electrical needs

Electricity Usage by IRP Treatment Systems



Artist rendering, Fuhrlander FL-1500

Air Emission Reductions

Pounds per year. Includes both wind turbine production and purchases of green power

- CO₂: 8,210,000
- NO_x: 8,836
- SO₂: 23,564
- PM₁₀: 506
- VOCs: 309

Sustainability Evaluation

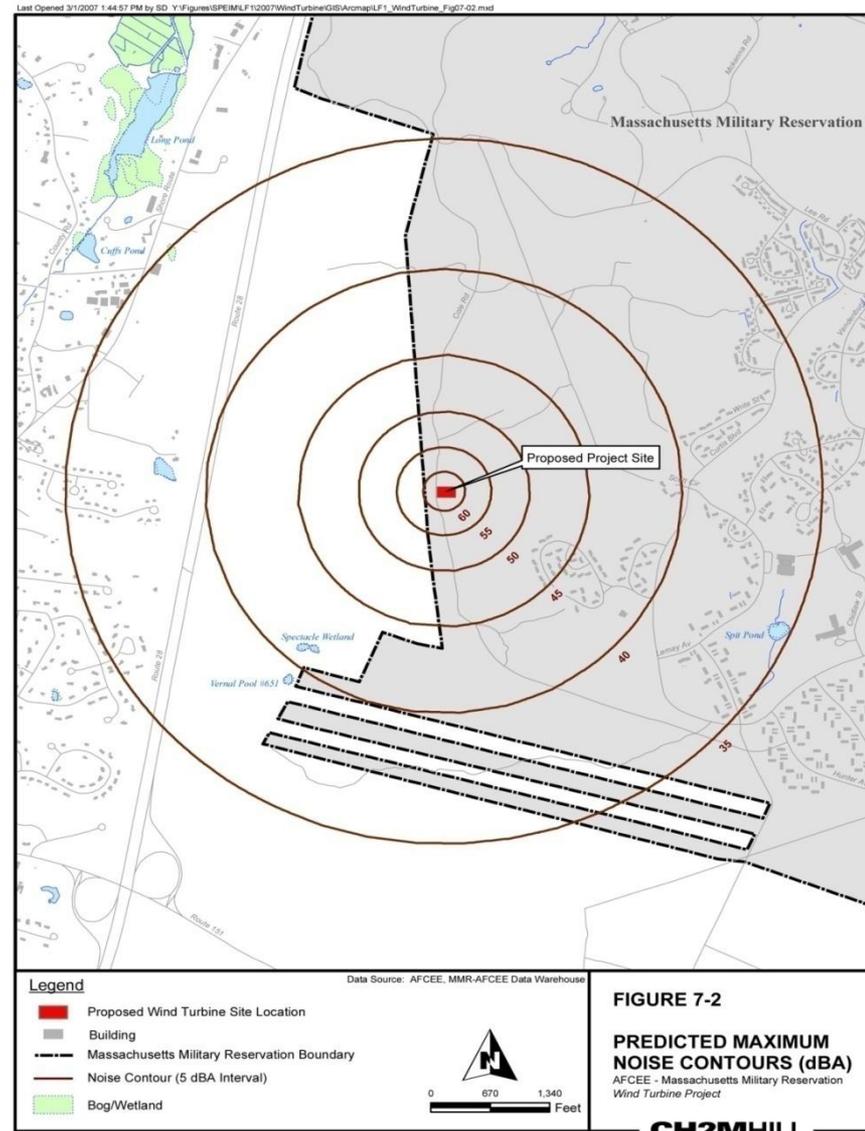
Wind Turbine - Energy Optimization

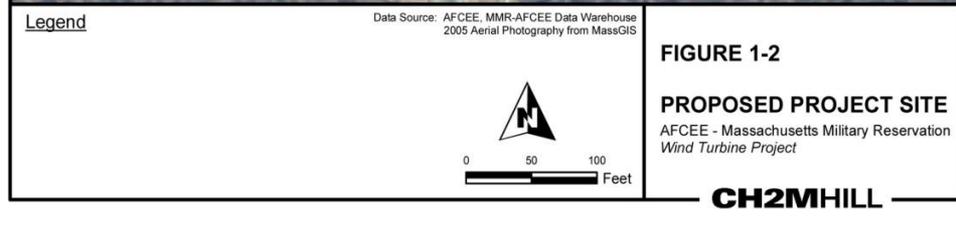
- Expected to produce ~ 3,810 MWh yearly (29% capacity factor)
- Annual load from treatment systems (in 2007) ~ 12,300 MWh
- Expected to generate 25-30% of AFCEE's total electrical requirement (>\$2M in 2009)
- Expected to reduce ~25-30% air emissions
- Payback anticipated in 6-8 years (RECs/O&M); working on a better ROI



Flicker/Sound Issues

- No complaints from residents registered to date
 - Some flicker
 - Some sound





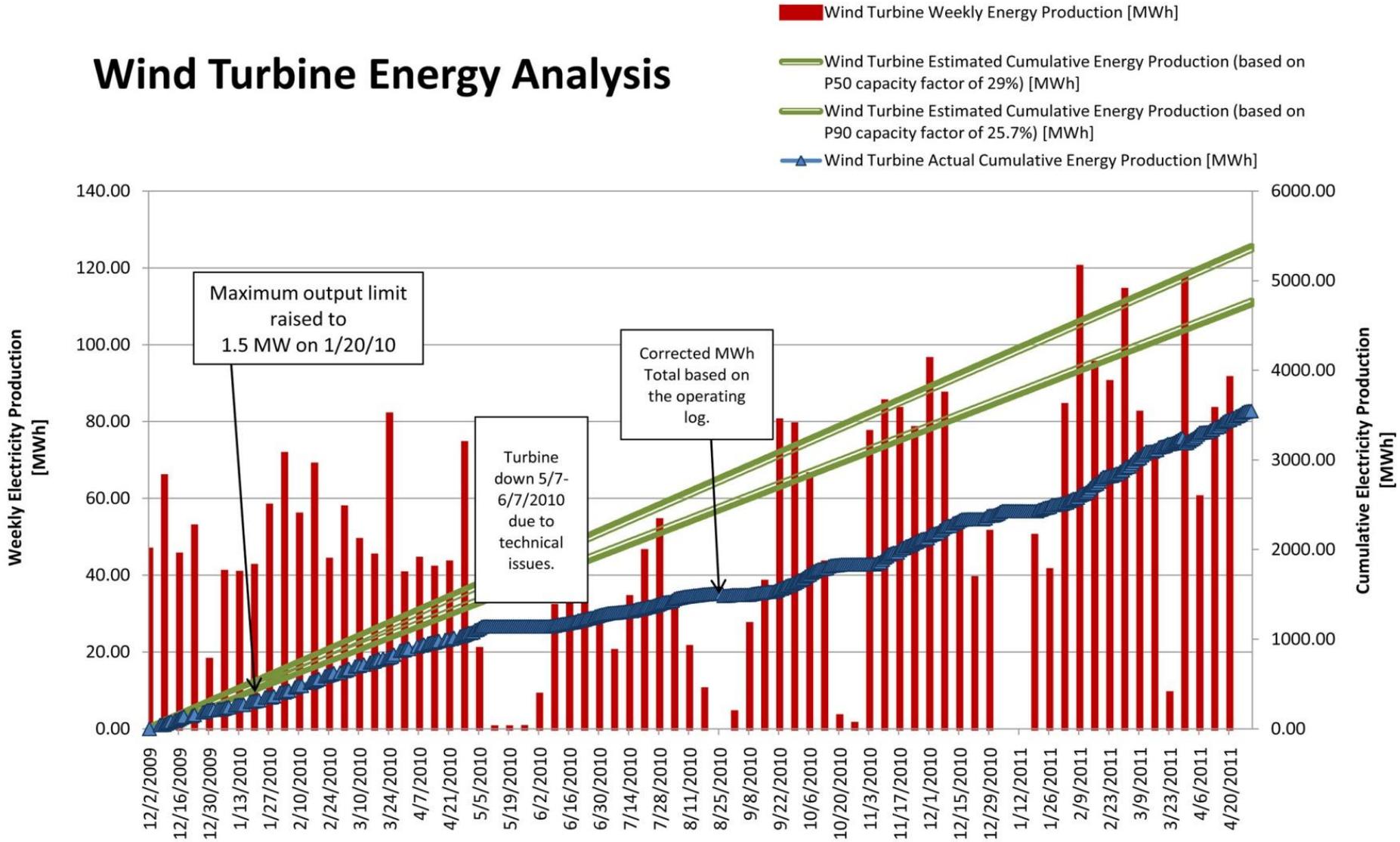
Wind Turbine Costs

- Constructability Assessment/Environmental Assessment (CH2M Hill) - ~ \$400,000
- Construction contract awarded in Sep 2007 (ECC), \$4.87M (includes O&M contract for two years)
 - \$5000 for Safety Training
 - \$29,900 per year for two years (FLAG O&M sub - 2 maintenance events per years + warranty + availability guarantee)
 - \$20,000 for website development
 - \$2700 for blade inspection (year 1);
\$2800 for blade inspection (year 2)
- Title II Services/Oversight (CH2M Hill) - \$150,000
- NSTAR Interconnection/Witness Test Costs - \$53,858

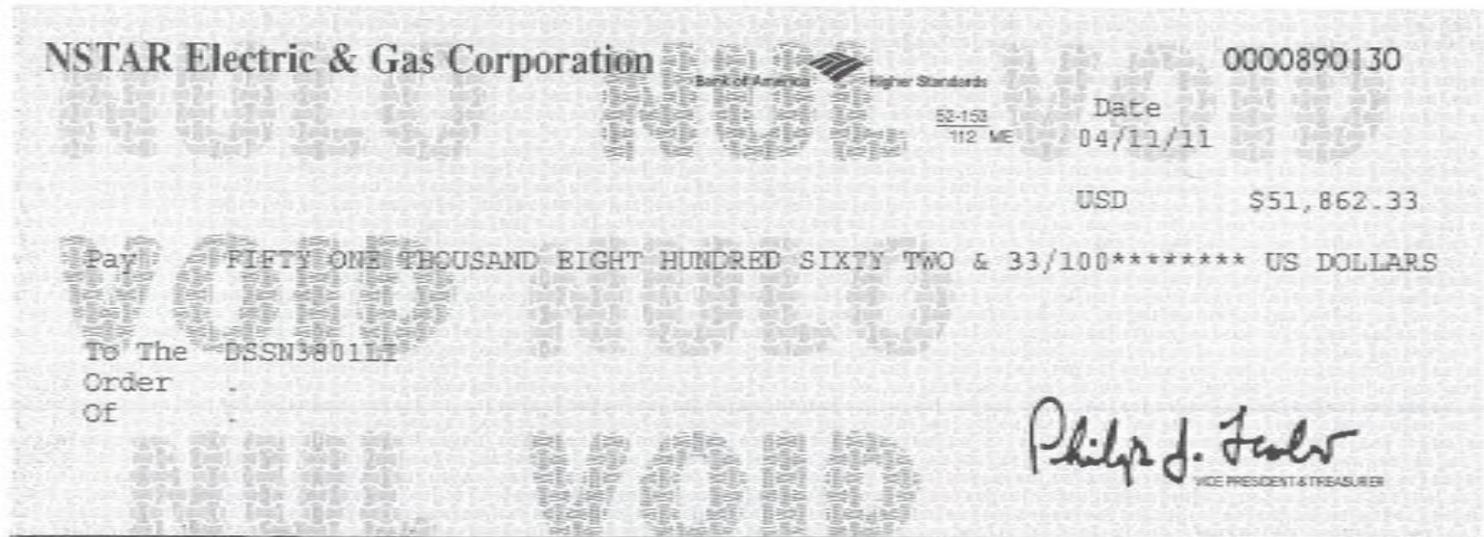


Corrected MWh Total based on the operating log.

Wind Turbine Energy Analysis



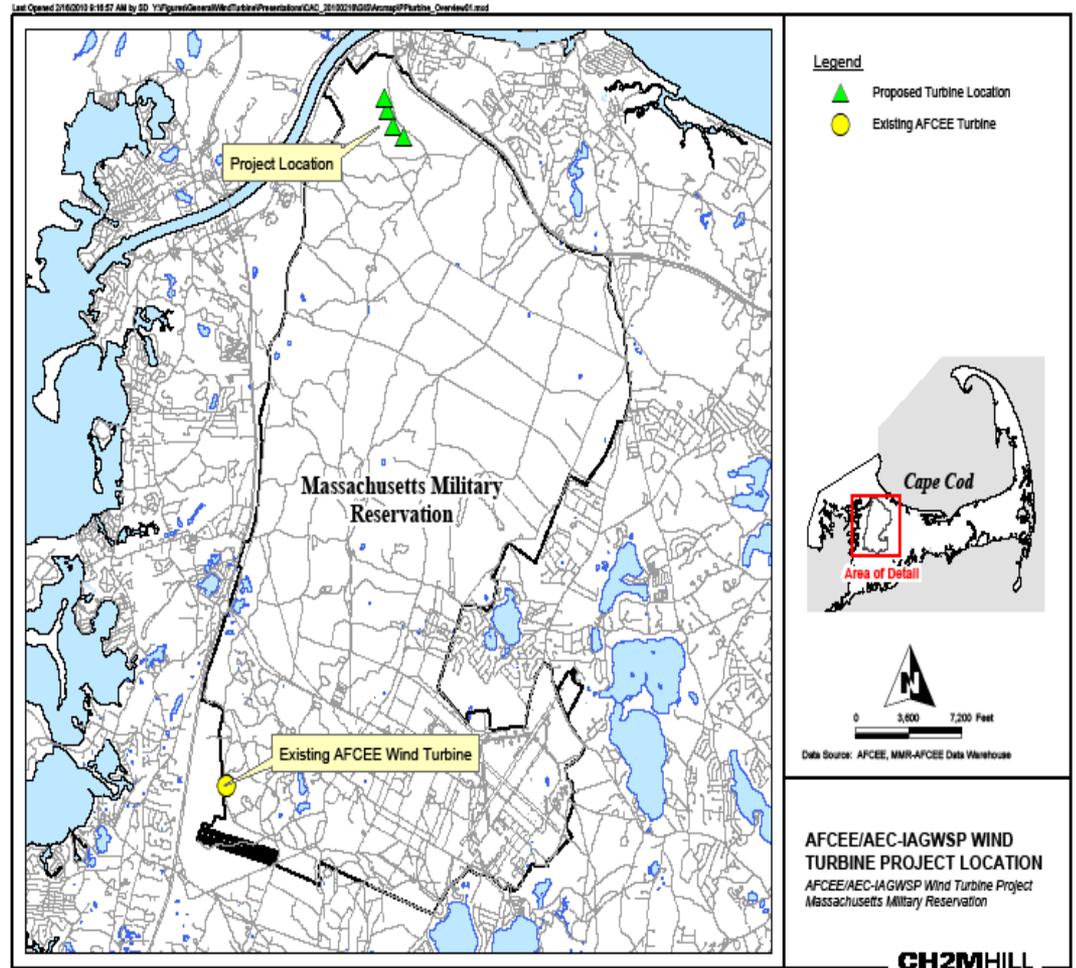
25 Jan – 23 Feb 2011



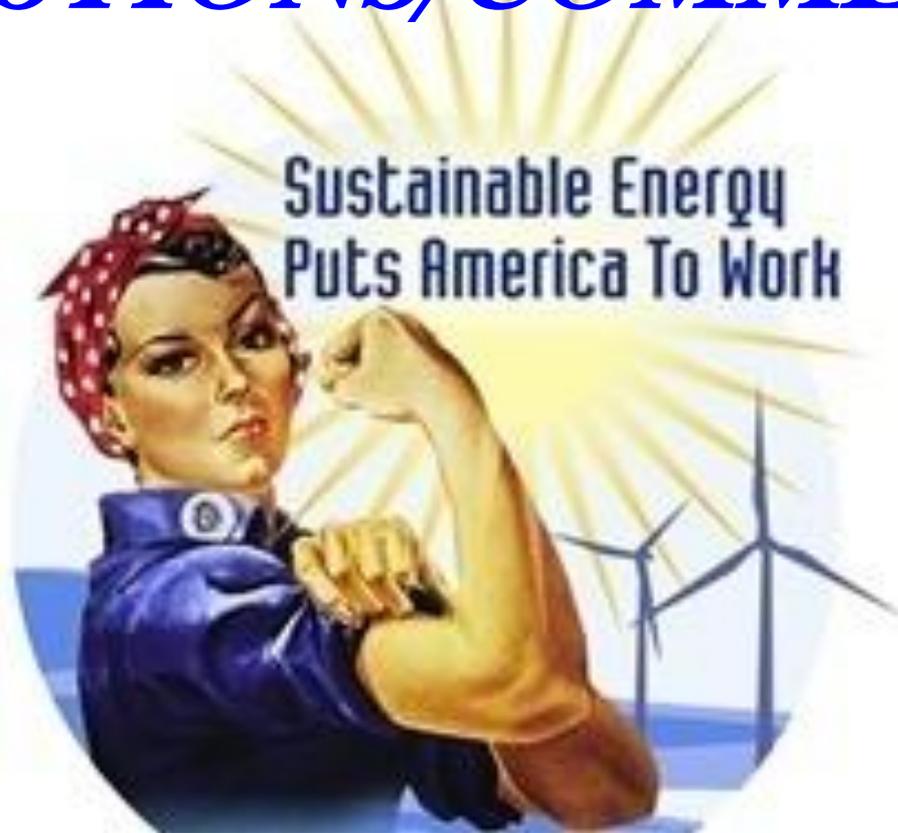
\$530,268.36: 02 Dec 2009-25 May 2011
(+ \$60,000 availability guarantee for first year)

Wind Turbine II

- 2 new GE 1.5-77 wind turbines in northern part of MMR
- Constructability Assessment/EA (CH2M Hill) - \$462,284
- Construction Contract (ECC) + one year O&M = \$9.4M
- Title II Oversight/Environmental Surveys - \$340,994.82
- Nstar Costs TBD – could be \$200-\$300k; complex interconnection



QUESTIONS/COMMENTS?



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